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10/539,726	07/19/2006	Sergey Amontov	CH920020037US1	8613

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ART UNIT	PAPER NUMBER
1637	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/539,726	AMONTOV ET AL.	
	Examiner	Art Unit	
	ANGELA BERTAGNA	1637	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 October 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-17 and 20-23* is/are pending in the application.

4a) Of the above claim(s) *23* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4-17 and 20-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/16/08*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of the Application

1. Applicant's response filed on October 8, 2008 is acknowledged. Claims 1, 4-17, and 20-23 are currently pending. In the response, Applicant amended claim 1. Claim 23 remains withdrawn as being drawn to a non-elected invention.

The following include new grounds of rejection necessitated by Applicant's amendments to the claims. Applicant's arguments filed on October 8, 2008 that remain relevant to the new grounds of rejection presented below have been fully considered, but they were not persuasive for the reasons set forth in the "Response to Arguments" section. Accordingly, this Office Action is made FINAL.

Information Disclosure Statement

2. The information disclosure statement filed on May 16, 2008 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. Specifically, the copies submitted on May 16, 2008 do not appear to be complete copies of the cited non-patent literature documents.

Claim Rejections - 35 USC § 112, 2nd paragraph

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 4-17, and 20-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 4-17, and 20-22 are rejected under 35 U.S.C. 112, second paragraph, because the meaning of the term "homogeneous monolayer" appearing in line 11 of independent claim 1 is unclear. For example, it is not clear whether a "homogeneous monolayer" is limited to monolayers consisting of molecules having the same identity, such as nucleic acids or proteins of identical nucleotide or amino acid sequence, or if monolayers consisting of the same type of molecule (*e.g.* DNA, RNA, or protein) or having homogeneous surface properties (*e.g.* length of molecules attached thereto or lateral homogeneity) are encompassed by the term "homogeneous monolayer". Since the scope of the claimed methods is unclear, claims 1, 4-17, and 20-22 are indefinite. All of the above interpretations of the term "homogeneous monolayer" have been considered in analyzing the prior art.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 4-7, 9, 10, 14-17, and 20-22 rejected under 35 U.S.C. 102(b) as being anticipated by Church (US 6,432,360 B1; cited previously).

These claims are drawn to a method for producing a homogeneous monolayer of molecules on a surface comprising transferring seed molecules from a stamp to the surface and producing the homogeneous monolayer via amplification on the surface.

Regarding claim 1, Church teaches a method for producing a monolayer of molecules on a surface (see columns 8-15) comprising:

(a) loading a stamp with seed molecules (column 15, lines 1-55)

(b) transferring seed molecules from the stamp to the surface, wherein the transferring comprises transferring a fraction of the seed molecules loaded on the stamp to the surface and adsorbing the seed molecules to the surface (column 15, lines 52-55)

(c) self-completing amplification of the seed molecules via an amplifying reaction to produce the monolayer (column 15, line 56 teaches amplification of the transferred seed molecules; see column 13, line 58 – column 14, line 67 for further description).

Further regarding claim 1, since not all of the seed molecules are transferred during the microcontact printing step (see column 15), the adsorption of the seed molecules to the stamp is inherently stronger than the adsorption of the seed molecules to the surface.

Further regarding claim 1, Church also teaches an embodiment of the method that produces a monolayer wherein all of the nucleic acids comprising the monolayer are the same length (see column 21, lines 34-57). Also, it is noted that the monolayers resulting from the amplification reactions of Church consist of one type of molecule (nucleic acid or protein). Thus, Church teaches homogeneous monolayers as required by amended claim 1.

Regarding claim 4, Church teaches that the amplification comprises linear amplification of the seed molecules (see column 14, where the reverse transcription step is a linear amplification).

Regarding claims 5 and 14-16, Church teaches PCR amplification of the seed molecules (column 13, lines 60-65 and column 14, lines 8-12), which is an exponential amplification method. Church further teaches that this method comprises binding at least one primer to the surface and supplying a primer in solution (see columns 13-14).

Regarding claims 6, 7, 9, and 10, the PCR amplification taught by Church is a directional amplification method that is inherently controlled by the geometry of the seed molecules. The amplification is also controlled by application of an external force, specifically heating (see, for example, columns 13-14). Finally, the nucleic acids amplified by the method of Church are inherently conductive structures.

Regarding claim 17, Church teaches *in vitro* translation to generate a protein monolayer (column 9, lines 10-15).

Regarding claim 20, the monolayer produced by Church inherently protects the surface from etchants.

Regarding claim 21, Church teaches that the monolayer comprises DNA (see, for example, column 15, lines 37-56).

Regarding claim 22, Church teaches repeating the transferring and amplifying steps on a plurality of surfaces before reloading the stamp with seed molecules (column 3, lines 58-63).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Church (US 6,432,360 B1; cited previously) in view of Richter et al. (Advanced Materials (2000) 12(7): 507-510; cited previously).

Claim 8 is drawn to the method of claim 6, further comprising electroless plating of the directionally amplified seed molecules with a metal.

Church teaches the method of claims 1, 4-7, 9, 10, 14-17, and 20-22, as discussed above.

Church does not teach electroless plating of the directionally amplified seed molecules with a metal.

Richter teaches that DNA molecules can be metallized and electrolessly plated to form useful nanostructures such as nanowires (see pages 508-510).

It would have been *prima facie* obvious for one of ordinary skill in the art at the time of invention to apply the teachings of Richter to the methods taught by Church. An ordinary artisan would have been motivated to metallize and electrolessly plate the amplified nucleic acids on the replica plate of Church as taught by Richter in order to obtain the ability to generate useful nanostructures, such as nanowires. Thus, the method of claim 8 is *prima facie* obvious over Church in view of Richter.

8. Claims 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Church (US 6,432,360 B1; cited previously) in view of Korlach et al. (US 2003/0044781 A1; cited previously).

Claims 11 and 13 are drawn to the method of claim 10, wherein the directional amplification of the seed molecules is controlled via application of an electric force or a hydrodynamic force, respectively.

Church teaches the method of claims 1, 4-7, 9, 10, 14-17, and 20-22, as discussed above.

Church does not teach controlling the amplification reaction with an electrical or hydrodynamic force.

Korlach teaches a method for producing a monolayer of molecules on a surface, comprising: (a) loading a stamp with seed molecules, (b) transferring the seed molecules from the stamp to the surface, and (c) directionally amplifying the seed molecules to produce the monolayer (see Figure 1 and paragraph 39).

Regarding claims 11 and 13, Korlach teaches that the directional amplification is controlled by application of an external force, specifically an electrical or hydrodynamic force (see paragraph 60, where the nucleotide substrates used in the amplification process are supplied by electrical or hydrodynamic forces).

It would have been *prima facie* obvious for one of ordinary skill in the art at the time of invention to control the directional amplification step in the methods taught by Church by applying any force known to be useful for controlling amplification, such as the electric and hydrodynamic forces taught by Korlach. An ordinary artisan would have recognized that these forces were art-recognized equivalents useful for achieving the same purpose, namely controlling directional amplification, and therefore, would have been motivated to substitute one for the other with a reasonable expectation of success. Also, see MPEP 2144.06, which states that the substitution of art-recognized equivalents known to be useful for the same purpose is *prima facie* obvious. Thus, the methods of claims 11 and 13 are *prima facie* obvious over Church in view of Korlach in the absence of secondary considerations.

9. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Church (US 6,432,360 B1; cited previously) in view of Mian et al. (US 5,686,271; cited previously).

Claim 12 is drawn to the method of claim 10, wherein the directional amplification reaction is controlled via application of a magnetic force.

Church teaches the method of claims 1, 4-7, 9, 10, 14-17, and 20-22, as discussed above.

Church does not teach that the amplification is controlled by an applied magnetic force.

Mian teaches a method for conducting PCR using magnetic fields termed a "magnetic cycle reaction" or MCR. The MCR method taught by Mian comprises assembling a PCR reaction mixture, conducting multiple cycles of denaturation, annealing, and extension using an electromagnetic field to effect strand separation (see Example 7, column 16, line 50 – column 18, line 9). In the method of Mian, one primer is immobilized on a surface and the other primer is supplied in solution (see Example 7, column 16, lines 50-66, where one primer is immobilized on the bottom of a well of a microtiter plate and the other primer is added in solution).

Regarding claim 12, the PCR amplification taught by Mian is controlled by application of a magnetic field (see Example 7, column 16, line 50 – column 18, line 9).

Mian teaches that magnetic control of PCR amplification has a number of advantages relative to conventional PCR, where high temperatures are used to denature double-stranded DNA targets. Specifically, Mian teaches that the use of electromagnetism for strand separation eliminates the need to use a thermophilic polymerase in the PCR reaction and permits the use of mesophilic polymerases. Mian teaches that this is advantageous, because mesophilic polymerases have higher fidelity, faster extension rates, and greater processivity than their thermophilic counterparts, thus resulting in a faster, more accurate amplification process that is capable of amplifying longer targets (column 2, lines 19-45).

It would have been *prima facie* obvious for one of ordinary skill in the art at the time of invention to substitute the MCR reaction as taught by Mian for the conventional nucleic acid amplification reactions taught by Church. An ordinary artisan would have been motivated to do so, since Mian taught that electromagnetic denaturation permitted the use of mesophilic polymerases with higher fidelity, faster extension rates and greater processivity than their

thermophilic counterparts, thus resulting in a faster, more accurate amplification process capable of amplifying longer templates (column 2, lines 19-45). Thus, the method of claim 12 is *prima facie* obvious over Church in view of Mian.

Response to Arguments

10. Applicant's arguments filed on October 8, 2008 have been fully considered, but they were not persuasive.

Applicant argues that the rejection of claims 1, 4-7, 9, 10, 14-17, and 20-22 under 35 U.S.C. 102(b) as being anticipated by Church has been obviated in view of the amendment of independent claim 1 to require that the amplification process produces a homogeneous monolayer of molecules on the surface (see pages 6-7). This argument was not persuasive, because as discussed above, Church also teaches an embodiment of the method described previously that produces a monolayer wherein all of the nucleic acids comprising the monolayer are the same length (see column 21, lines 34-57). Thus, Church teaches forming a homogeneous monolayer of molecules on the surface via a self-completing amplification reaction as required by amended claim 1. As discussed above in section 3, the term "homogeneous monolayer" is not limited to monolayers consisting of nucleic acids or proteins having an identical nucleotide or amino acid sequence, and the monolayers of Church, which have the same length and consist of one type of macromolecule (*i.e.* nucleic acids or proteins) constitute "homogeneous monolayers". Since Applicant's arguments were not persuasive, the rejection of claims 1, 4-7, 9, 10, 14-17, and 20-22 under 35 U.S.C. 102(b) as being anticipated by Church has been maintained.

Regarding the rejections of claims 8 and 11-13 made under 35 U.S.C. 103(a) citing Church as the primary reference, Applicant argues that Church fails to teach all of the elements of independent claim 1 as amended and that the cited secondary references do not overcome this deficiency in the primary reference (see pages 7-9). This argument was not persuasive, because as discussed above, Church teaches all of the elements of claims 1, 4-7, 9, 10, 14-17, and 20-22. Therefore, the cited secondary references are only relied upon for those teachings relevant to dependent claims 8 and 11-13. Since Applicant's arguments were not persuasive, the rejections have been maintained.

Conclusion

11. No claims are currently allowable.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANGELA BERTAGNA whose telephone number is (571)272-8291. The examiner can normally be reached on M-F, 7:30 - 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gary Benzion can be reached on 571-272-0782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

amb
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